Prevalence and Management of Hypertension along with its Complications - A Prospective Study

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Authors' contributions

This work was carried out in collaboration among all authors. Author AD designed the study and guided. Author REMPC wrote the first draft of the manuscript. Author MMS managed the analysis of the study. Authors MS and QAK collected the data, managed the literature searches. Author PSR performed the statistical analysis of the data, drafted and finalized the manuscript. All authors read and approved the final manuscript.

Article Information

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ABSTRACT

Aim: The main aim of the study was to estimate the prevalence of hypertension and correlate hypertension with the occurrence of its complications.
Study Design: The study was designed to detect the adverse outcomes of uncontrolled hypertension and review the treatment patterns in the management of hypertension along with the complications.
Place and Duration of the Study: This study was an observational study conducted for a period of six months from January to June 2020, at THUMBAY HOSPITAL NEW LIFE, in an inpatient department.
Methodology: Using a suitable designed data form, details of the patient were collected from patient demographics, prescription charts, laboratory data, medical records, doctor's and nursing notes.

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Results: In this study, the prevalence of hypertension was found to be more in males (52.5%) than in females (47.5%). Among all age groups, individuals aged 50-59 yrs were highly affected. From the study, it was found that a greater number of patients fall in the category of stage-2 hypertension (38.75%) followed by hypertension crisis (28.75%), stage-1 hypertension (25%), and normal (7.5%). More patients with uncontrolled hypertension experienced cardiovascular complications (55%) when compared to cerebrovascular (27.5%) and renal (17.5%) complications. Chi Squared Test was used to analyse the significance of the study. P values < 0.0001 was considered as statistically significant.

Conclusion: It was concluded that the choice of antihypertensive drugs used in the management of hypertension were diuretics followed by Angiotensin receptor blockers (ARBs) and Calcium Channel blockers. The most commonly prescribed drugs in the study were Furosemide, Telmisartan, Amlodipine, Metoprolol, followed by clinidipine, carvedilol, metolazone, perindopril, cardiopril, and torsemide.

1. INTRODUCTION

Globally, Hypertension (HTN) is affecting two third of the population resulting in 10.4 million deaths annually. Lack of awareness accompanied by low levels of treatment and uncontrolled rates lead to mortality [1]. High blood pressure or HTN is a heterogeneous group of disorders characterized by a persistent increase in blood pressure due to the force of blood pushing against the blood vessel walls, which develops over time due to unhealthy lifestyle choices. It is expressed in terms of the systolic pressure (representing the pressure due to ventricular contraction during systole) and diastolic pressure (representing pressure of ventricular relaxation in diastole), measured in milli meters of mercury or "mm of Hg" [2]. Despite several initiatives (like sodium reduction, limit alcohol intake, stress reduction, and educational sessions on blood pressure self-management), the prevalence of HTN and its adverse impact on cardiovascular, renal, and cerebrovascular morbidity and mortality are increasing worldwide [1]. A person is diagnosed with HTN when his systolic blood pressure (SBP) is >140 mm Hg and/or the diastolic blood pressure (DBP) is <90 mmHg on repeated examination. There exist different stages of Hypertension –

- Stage1 HTN: It requires assessment of heart disease and stroke for 10 years. Lifestyle modifications and BP reassess every 3-6 months are required if the risk doesn't exceed 10% and if higher it requires lifestyle changes along with medication with monthly follow-ups until BP is controlled.

- Stage 2 HTN: It requires lifestyle changes along with two different classes of medication with monthly follow-up until BP is controlled. Moreover, it is sometimes associated with a vascular damage on fundoscopic examination, but without papilledema.

- Stage 3 HTN or hypertensive emergency- In this condition the control of elevated BP can be done gradually without any evidence of end-organ damage.

The risk of complications is related to a degree of elevation of BP [3]. With each mm of Hg increase in BP, there is a 30% increase in cardiovascular, renal, and cerebrovascular morbidity and mortality. Hypertension increases the chance of serious health complications, which include heart damage, stroke, kidney damage and many more which may be fatal [4]. As blood pressure rises and the longer it remains consistent, the greater is the damage. Sometimes hypertension quietly damages the body for years before symptoms develop, hence considered as a "silent killer" [5]. The goal of treating HTN is to prevent the onset of complications that cause morbidity & reduce the quality of life. Since the realization that HTN was a major threat to CVD, methods of lowering elevated blood pressure have been developed. Lowering BP with antihypertensive drugs is the chief aim in reducing hypertensive complications like coronary artery disease, myocardial infarction and heart failure. Hypertension management mainly focuses on its etiological factors. Blood pressure values and co-morbidities involved are the basis of choosing drug therapy. The standard blood pressure goal for the management of HTN by JNC-VII is <140/90 mm Hg to prevent the complication such as cardiovascular diseases, cerebro vascular

disorders and many more [6]. Lifestyle modification is often considered as the first-line treatment of HTN. Preventing or delaying the onset of high BP can reduce many complications and following the antihypertensive treatment is highly effective for improving clinical outcomes.

Many individuals who are affected need to know their hypertensive status, receiving treatment on time which is effective is critical. There are certain studies which were conducted in some parts of India on prevalence, awareness and treatment of Hypertension. The main objective of the study was to assess the prevalence of hypertension, its complications and compare the differences in prescribing patterns of antihypertensive drugs in treating hypertensive complications [7].

2. METHODOLOGY

2.1 Study Design and Collection of Data

This study was an observational study conducted for a period of six months from January to June 2020, at THUMBAY HOSPITAL NEW LIFE, in an inpatient department. Patients who met the inclusion criteria were taken into consideration. Patients of either sex above 18 years of age, patients with blood pressure ≥ 130/90 mm of Hg and also patients with cardiovascular, renal or cerebrovascular diseases fell into the category of inclusion criteria. The exclusion criteria had pregnant and lactating mothers, along with paediatric population and also patients ≤ 18 years. Using a suitably designed collection data form with details like, patient demographics, clinical examination, Prescription chart, laboratory data, progress notes and patients medical record were collected. The mode of collection was through the interaction with the patient with their chief complaints, history of present illness, past medical and family history, medical records and patient prescription.

2.2 Study Subjects and Duration

In the present study, the patients (sample size was n=80), were interviewed with their chief complaints, history of the present illness, past medication history, family history, medical records and the prescription. The present study was conducted for a period of 6 months, starting from January to June 2020.

2.3 Objectives of the Study

In this investigation, the main objective was to assess the prevalence of hypertension along with its complications. Additinally to analyse the prescribing patterns for hypertension.

2.4 Statistical Analysis

The data collected from the patients was thoroughly analysed and entered into a computerized data base using Graph Pad Prism 5. Frequencies and percentages (descriptive statistics) were used for analysing the data. Chi-squared test was used to determine the significance of the parameters analysed. A p-value of equal to or less than 0.0001 was considered as statistically significant.

3. RESULTS

The clinical characteristics of the study population were shown in Table1. Overall, 80 patients were included in the analysis with the males and females. Amongst all the age groups, males aged 50-59 yrs were highly affected (n=15) being superior to the number of females (n=11). From the study, it was evident that a greater number of patients fall in the category of stage -2 HTN (38.75%) followed by HTN crisis (28.75%), stage – 1 HTN (25%), and normal (7.5%), the values being statistically significant (^{b}p < 0.0010).

Poor control of Hypertension is the best indicator of the onset of various medical complications, of which more number of patients experienced cardiovascular complications (55%) followed by cerebrovascular (27.5%) and renal (17.5%) diseases.

In the complications of Hypertension, for chronic kidney disease, furosemide was prescribed more (n=7) followed by Amlodipine and Torsemide. In the cardiovascular diseases, Metoprolol (n=14) was given for most of the patients followed by Telmisartan (n=12) and other drugs like furosemide, Amlodipine, Carvedilol and Torsemide (n=4). In the stroke patients, Telmisartan was prescribed for more (n=8) number of patients followed by Amlodipine (n=6) and other drugs Metaprolol, Perindopril, Furosemide and Clinidipine (n=2); the values were found to be statistically significant (^{b}p < 0.001, ^{b}p < 0.084). Further the drugs were categorised accordingly, to analyse the frequently prescribed class. In this regard,

Diuretics and CCBs (n=20) were specified medications for patients with Hypertension. ARBs (n=16) and beta blockers (n=10) were also given in the prescription for the Hypertensive patients. For few patients alpha and beta blockers were selected.

In this present study, as a part of management there was a division of four types of therapy for Hypertension, which were - monotherapy, dual therapy, triple and multiple therapy. In the monotherapy, Furosemide and Telmisartan were prescribed more (n=9 each) among the patients. CCBs (Amlodipine, n=6 and Clinidipine, n=4) were the next category of drugs noted to be prescribed followed by other anti-hypertensive agents. Beta blocker, Metoprolol (n=5) was also given importance in treating hypertensive patients. In the Dual therapy, combination of alpha + beta blocker (Metoprolol + Amlodipine) was gained weightage in prescription followed by combination of beta blocker with Telmisartan. In the triple therapy, the combination of alpha + beta + ARB was prescribed amongst all other anti-hypertensive drugs. In multiple therapy, diuretic along with alpha and beta blocker was found to be prescribed. All the values were noticed to be significant statistically ($^bp < 0.0001$).

Table 1. Clinical characteristics of study population (n=80)

	Frequency Gender	
	Males	Females
Age group (yrs)		
20 - 29	1	0
30 - 39	2	0
40 - 49	6	7
50 - 59	15	11
60 - 69	13	11
70 - 79	4	5
80 - 89	0	4
90 – 99	1	0
$^bp = 0.0017$; 95 % Confidence intervals; $r^2 = 0.8289$; F = 29.06	Mean – 5.25 SD – 5.37	Mean – 4.75 SD – 4.35

Table 2. Blood pressure categorization, different stages of Hypertension (n=80)

	No of patients	Percentage (%)
Stages of Hypertension		
Normal	6	7.5
Stage 1 HTN	20	25
Stage 2 HTN	31	38.75
Hypertensive crisis	23	28.75
$^bp < 0.0010$; Chi square – 16.3; df = 3; α < 0.05	Mean – 20 SD – 9.02	

Table 3. Blood pressure categorization based on complications (n=80)

Blood Pressure (mm of Hg)	Cardiovascular (55%)	Renal (17.5%)	Cerebrovascular (27.5%)
Stages of Hypertension			
Normal (130-139)	6	0	0
Stage 1 HTN (140-159)	10	5	5
Stage 2 HTN (160-179)	14	6	11
Hypertensive crisis (>180)	14	3	6
$^bp = 0.0001$; Chi square – 18.21; df = 3; α < 0.05	Mean – 11 SD – 3.31	Mean – 3.5 SD – 2.29	Mean – 5.5 SD – 3.90

Table 4. Drugs prescribed in CKD (Chronic Kidney Disease), CVD (Cardiovascular disease and Stroke; complications of Hypertension (n=80)

CKD	CVD	Stroke
Furosemide – 7 Amlodipine – 3 Clinidipine – 1 Torsemide – 3	Telmisartan – 12 Metoprolol – 14 Furosemide – 4 Amlodipine – 4 Carvedilol – 4 Torsemide – 4	Telmisartan – 8 Amlodipine – 6 Metoprolol– 2 Perindopril – 2 Furosemide – 2 Clinidipine – 2
(n=14) Mean – 3.5 SD – 2.17 Chi square – 5.429; Df – 3; [b]p = 0.143, not considered as significant	(n=44) Mean – 5.5 SD – 4.5 Chi square – 29.81; Df – 7; [b]p = 0.001, considered as significant	(n=22) Mean – 3.66 SD – 2.4 Chi square – 9.68; Df – 5; [b]p = 0.084, considered as significant

Table 5. Drug category prescribed in Hypertension

Category of Drugs	Frequency (n=80)
Diuretics	20
Angiotensin Converting Enzyme Inhibitors (AECIs)	5
Angiotensin Receptor Blockers (ARBs)	16
Calcium Channel Blockers (CCBs)	20
Beta blockers	10
Alpha blockers	5
Beta + Alpha blockers	4
[b]p = 0.0001; Chi square – 26.94; df = 6; α < 0.05	Mean – 11.42 SD – 6.63

4. DISCUSSION

Hypertension is a heterogeneous group of disorders characterized by a persistent elevation of arterial blood pressure [8]. Consistently elevated BP when left untreated may cause various other complications which include Coronary artery diseases, Heart failure, Chronic kidney disease, stroke and many more. In the present study, the number of hypertensive males were higher than that of hypertensive females, which may be due to lack of awareness, low medication adherence, deleterious social history, comorbid conditions and unhealthy lifestyle. Hypertension if treated to the targeted BP goals can reduce further complications/risks [9]. The treatment was always depended upon the guidelines designed and followed [10]. The data obtained from several countries emphasizes that < 50% of hypertensive adults are prescribed with anti-hypertensive agents on an average, with very few countries getting better. This difference might be because of minute differences in measuring the BP [11,12] and associated risk factors. In the present study, the choice of anti-hypertensive drugs used in the treatment of hypertension were primarily diuretics followed by Angiotensin receptor blockers (ARBs) and calcium channel blockers (CCBs), the data might be consistent with the other studies [13].

Educating people on hypertension, the importance of medication adherence, and directing them to lead a healthy life style can reduce the complications and also the upcoming overall burden on the health care system. The present study explored the type of therapy employed, monotherapy or dual or triple or multiple therapy was used indeed, depended upon the stage of hypertension. In the monotherapy most preferred drug was furosemide followed by telmisartan [14]. In the combination therapy, beta blocker along with ARB was given in the dual therapy, a combination of alpha, beta and ARB was prescribed in triple therapy. In multiple therapy, a combination of four drugs were chosen to have a positive impact on overall control of blood pressure.

Clinicians and patients need a combined effort to have a balance in pharmacologic and non-

pharmacologic interventions in combating the organ damage [15,16]. Developing innovative and cost-effective solutions to improve hypertension diagnosis and control thus remains a key priority. Ignorance of hypertension, associated risk factors, lifestyle changes, and low medication adherence have identified as major inducing factors in the increasing prevalence of uncontrolled hypertension [17,18]. Adhering to the treatment guidelines and accepting the challenges by the clinicians might be a magic bullet for successful treatment and patient compliance.

Table 6. Therapy followed in Hypertension

Category of Drugs	Frequency (n=80)
Monotherapy –	38
Furosemide 9	
Metoprolol 5	
Telmisartan 9	
Carvedilol 1	
Metolazone 1	
Clinidipine 4	
Amlodipine 6	
Perindopril 1	
Cardiopril 1	
Torsemide 1	
Dual Therapy -	26
Labetolol + Telmisartan 2	
Furosemide + Amlodipine 1	
Metoprolol + Telmisartan 5	
Metoprolol + Amlodipine 4	
Metoprolol + Prazosin 1	
Furosemide + Carvedilol 2	
Carvedilol + Spironolactone 1	
Metoprolol + Clinidipine 1	
Amlodipine + Perindopril 1	
Amlodipine + Moxonidine 1	
Mannitol + Telmisartan 2	
Telmisartan + Chlorthalidone 1	
Torsemide + Telmisartan 2	
Carvedilol + Clinidipine 1	
Telmisartan + Torsemide 1	
Triple Therapy -	13
Metaprolol + Telmisartan + Furosemide 1	
Valsartan + Carvidolol + Torsemide 1	
Telmisartan + Metoprolol + Amlodipine 2	
Telmisartan + Clinidipine + Prazosin 1	
Furosemide + Amlodipine + Bisoprolol 1	
Clinidipine + Torsemide + Telmisartan 1	
Labetolol + Telmisartan + Clinidipine 1	
Furosemide + Mannitol + Nifedipine 1	
Nifedipine + Amlodipine + Perindopril 1	
Multiple Therapy –	03
Nifedipine + Moxonidine + Metoprolol + Torsemide 1	
Spironolactone + Torsemide + Bisoprolol + Amlodipine 1	
Furosemide + Metoprolol + Clinidipine + Torsemide 1	
[b]$p = 0.0001$; Chi square – 34.90; df = 3; $\alpha < 0.05$	Mean – 20;SD – 13.2

5. CONCLUSION

The above study concluded that the most of the patients with uncontrolled hypertension were suffered from cardiovascular diseases. The most common choice of therapy followed was the monotherapy which included Telmisartan and Furosemide. Individuals with early stages of Hypertension were treated with monotherapy depending upon the single comorbid condition while the patients with severe complications or more than one comorbid condition might be preferred with a combination of drugs. Whether it is a single drug therapy or a combination, the blood pressure must be treated keeping in view of the patient compliance. A life style modification, a regular physical activity may have a good impact on hypertension control thus preventing further complications.

DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

CONSENT

It is not applicable.

ETHICAL APPROVAL

The protocol was presented in Institutional review board and obtained permission with approval number MRMCP/2020/5.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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